1. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 1 hours, the petri dish has 14 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

   A. About 55 minutes

   B. About 50 minutes

   C. About 332 minutes

   D. About 304 minutes

   E. None of the above

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2. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 1 hours, the petri dish has 31 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

   A. About 192 minutes

   B. About 32 minutes

   C. About 43 minutes

   D. About 259 minutes

   E. None of the above

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3. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 949 grams of element X and after 6 years there is 158 grams remaining.

A. About 730 days

B. About 2555 days

C. About 1095 days

D. About 1 day

E. None of the above

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4. A town has an initial population of 80000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	80030	80060	80090	80120	80150	80180	80210	80240	80270

A. Exponential

B. Non-Linear Power

C. Logarithmic

D. Linear

E. None of the above

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5. A town has an initial population of 100000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	99980	99960	99940	99920	99900	99880	99860	99840	99820

A. Linear

B. Non-Linear Power

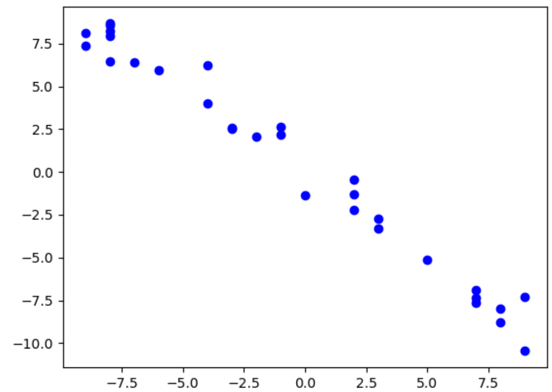
C. Logarithmic

D. Exponential

E. None of the above

---

6. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Exponential model

C. Logarithmic model

D. Linear model

E. None of the above

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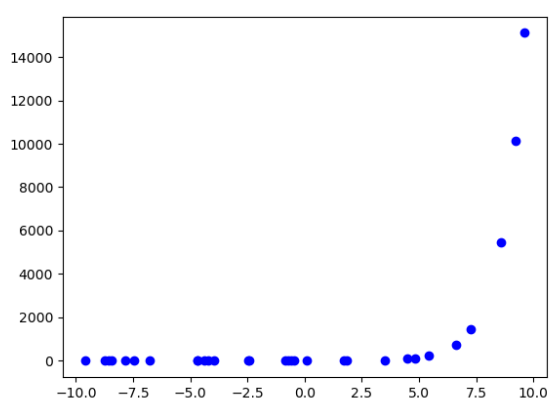
7. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Linear model

C. Exponential model

D. Non-linear Power model

E. None of the above

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8. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 130° *C and is placed into a* 11° *C bath to cool. After 32 minutes, the uranium has cooled to* 80° *C.*

A. $k = -0.01703$

B. $k = -0.02255$

C. $k = -0.02290$

D. $k = -0.01979$

E. None of the above

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9. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 140° *C and is placed into a* 14° *C bath to cool. After 27 minutes, the uranium has cooled to* 82° *C.*

A. $k = -0.02284$

B. $k = -0.02678$

C. $k = -0.02675$

D. $k = -0.02630$

E. None of the above

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10. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 810 grams of element X and after 4 years there is 115 grams remaining.

A. About 1825 days

B. About 1 day

C. About 730 days

D. About 365 days

E. None of the above
